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5 USSR: ADVANCES IN SIGNAL PROCESSING AND BIPOLAR FABRICATION TECHNOLOGIES [ ] 25X1

A recent Soviet export journal describes a Soviet 8x8 bit digital multiplier chip; the existence of the chip has caused us to change significantly our previous estimates of Soviet bipolar integrated-circuit technology, as well as Soviet digital signal processing capabilities. [ ] 25X1

7 USSR: SCIENTIFIC DISCOVERY USED IN THE MANUFACTURE OF REFRACTORY MATERIALS (U)

A recent Soviet article stated that "the phenomenon of wave localization of self-inhibiting solid-phase reactions" had been registered as a discovery; the discovery is used in the manufacture of refractory materials with military application in armor, engines, heat shields, and structural materials. [ ] 25X1

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USSR: ENHANCED SPACE LIGHT MODULATOR FOR HIGH-TECHNOLOGY OPTICAL PROCESSORS

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In an unclassified article submitted for publication in September 1983, four Soviet scientists from Novosibirsk described a modified "Preobrasovatel Izobrazheniy" (PRIZ) spatial light modulator (SLM) that has enhanced sensitivity. The PRIZ SLM was enhanced by doping the bismuth silicate crystal, from which the PRIZ is produced, with tin. The tin dopant was applied to the crystal by diffusion.

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According to the article, the PRIZ SLMs that are produced from tin-doped crystals are 60 times more sensitive than those that are produced from undoped crystals. The reported sensitivity of the devices produced with the tin-doped material is 80 nanojoules per square centimeter.

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Comment:

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The improved PRIZ probably will allow the Soviets to fabricate more complicated optical processing networks than would have been possible with the older version of the PRIZ. High-sensitivity SLMs are especially important in systems that require a series of mathematical operations. Such operations cause losses in the optical signal because several optical devices often are placed in a series to perform complex operations. The enhanced sensitivity PRIZ probably can at least partially compensate for these losses. The improved PRIZ may require a lower power laser source,

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which in turn reduces electrical power, weight, and volume requirements. [redacted] 25X1

The PRIZ was invented by the Soviets around 1979 and was a technological surprise to the West. [redacted] 25X1

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USSR: SCIENTIFIC DISCOVERY USED IN THE MANUFACTURE OF REFRACTORY MATERIALS 25X1

A recent Soviet article stated that "the phenomenon of wave localization of self-inhibiting solid-phase reactions" has been judged a discovery and entered as number 287 in the State Register. The authors of the discovery were identified as A. Merzhanov, Doctor of Physical-Mathematical Sciences; I. Borovinskaya, Candidate of Chemical Sciences; and V. Shkiro, Science Associate of the USSR Academy of Sciences Institute of Chemical Physics. 25X1

Comment:

The discovery, more commonly known as self-propagating high-temperature synthesis (Russian acronym SVS), is used in the manufacture of refractory materials that are chemically stable at high temperatures, hard, and resist wear and corrosion. Potential military applications for these materials include armor, engines, heat shields, and structural materials. 25X1

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The fact that heat produced in some exothermic reactions may cause the resulting temperature to rise by several thousand degrees is the basis of SVS. An example is the thermite reaction. A powder composed of two or more elements is compacted and then ignited at one end. The result is the liberation of heat with the heat propagating along the unreacted powder as a combustion wave moving at 2.5 to 15 centimeters per second and at a temperature of 1400-3500 degrees Celsius. The end result of the process is the conversion of the material to a chemical compound. 25X1

The Soviets find SVS attractive compared to conventional powder processes because there is no need of complex and expensive equipment to obtain crack-free products at theoretical density. Additionally, the synthesis times are short (a few seconds) and there is no by-product formation.

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The Soviets have synthesized over 200 compounds, primarily involving metal and non-metal reactions although metal-metal and non-metal-non-metal reactions also have been studied. The Soviets also are using SVS in commercial applications. SVS-produced titanium nickelide is being used in aircraft fuel lines and SVS titanium carbide is being used as an abrasive.

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